SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-43

Name: Lake Mitchell **County**: Davison
Legal Description: T103W- R60N-Sec 4-6, 9; T104N- R60W-Sec 31-32
Location from nearest town: Northwest side of Mitchell, SD

Dates of present survey: July 6-8, 2010 (netting), September 30, 2010 (electrofishing for walleye)
Date last surveyed: July 6-8, 2009 (netting), June 3, 2009 (electrofishing for largemouth bass), September 29, 2009 (electrofishing for walleye)

Managed Species	Other Species
Bluegill	Channel Catfish
Black Crappie	White Crappie
Largemouth Bass	Northern Pike
Smallmouth Bass	Freshwater Drum
Walleye	Black Bullhead
	Common Carp
	White Sucker
	Shorthead Redhorse

PHYSICAL DATA

Surface Area: 670 acres **Watershed area**: 229,911 acres
Maximum depth: 29 feet **Mean depth**: 12.2 feet
Volume: 8,212 acre-feet **Shoreline length**: 10 miles
Contour map available: Yes **Date mapped**: 1970
Lake elevation observed during the survey: Full
Beneficial use classifications: (1) domestic water supply, (4) warmwater permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) wildlife propagation and stock watering.

Introduction

Lake Mitchell was constructed in 1928 by the City of Mitchell to serve as a domestic water supply and a regional recreation center. The primary source of water is Firesteel Creek, which has two main branches and drains a watershed that extends 50 miles above the lake.

Ownership of Lake and Adjacent Shoreline Properties

Lake Mitchell is owned by the City of Mitchell. The South Dakota Department of Game, Fish, and Parks (GFP) manages the fishery. The City of Mitchell owns several public access areas and parks around the lake. The remainder of the lakeshore is privately owned and heavily developed.

Fishing Access

The West City Access Area has a double lane boat ramp, dock, parking lot, and public toilets. The Southeast City Access Area has a single lane boat ramp, dock, and parking lot. All access areas and parks provide ample shore fishing opportunities. A handicapped-accessible fishing pier is planned for the near future.

Field Observations of Water Quality and Aquatic Vegetation

The water in Lake Mitchell was more turbid than usual during this survey with a Secchi depth measurement of 67 cm (26.4 in). Beds of sago pondweed (*Potamogeton pectinatus*), common cattail (*Typha spp.*), and duckweed (*Lemna spp.*) were common in the bays and creek arms. Large stands of common cattail were found in Kippes Bay and in the west end of the lake where it had been absent for several years.

BIOLOGICAL DATA

Methods:

Lake Mitchell was sampled on July 6-8, 2010 with six overnight gill net sets and twelve overnight trap net sets. The trap nets are constructed with 19-mm-bar-mesh (¾ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh (½, ¾, 1, 1¼, 1½, and 2 in) monofilament netting. Two hours of nighttime electrofishing were done on September 30, 2010 to monitor walleye recruitment. Sampling locations are displayed in Figure 3.

Gill Net Catch

Channel catfish (24.6%), freshwater drum (22.5%), and black bullhead (18.8%) were the most common species caught in the gill nets. The sample also included small numbers of eight other species (Table 1).

Table 1. Total catch from six overnight gill net sets at Lake Mitchell, Davison County, July 6-8, 2010.

Species	Number	Percent	CPUE[1]	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Channel Catfish	34	24.6	5.7	±2.1	8.6	78	13	91
Freshwater Drum	31	22.5	5.2	±2.7	8.2	90	5	86
Black Bullhead	26	18.8	4.3	±2.8	2.5	8	0	91
Walleye	20	14.5	3.3	±1.0	2.1	55	0	83
White Sucker	15	10.9	2.5	±1.4	0.5	67	27	91
Northern Pike	3	2.2	0.5	±0.3	0.7	--	--	--
Common Carp	3	2.2	0.5	±0.3	0.9	--	--	--
Shorthead Redhorse	2	1.4	0.3	±0.4	7.1	--	--	--
Bluegill	2	1.4	0.3	±0.3	0.5	--	--	--
Black Crappie	1	0.7	0.2	±0.2	1.8	--	--	--
Flathead Catfish	1	0.7	0.2	±0.2	0.0	--	--	--

* 10 years (2000-2009)

[1] See Appendix A for definitions of CPUE, PSD, and mean Wr.

Table 2. Catch per unit effort by length category for various fish species captured by gill nets in Lake Mitchell July 6-8, 2010.

Species	Substock	Stock	S-Q	Q-P	P+	All sizes	80% C.I.
Channel Catfish	0.3	5.3	1.2	3.5	0.6	5.7	±2.1
Freshwater Drum	1.7	3.5	0.3	3.0	0.2	5.2	±2.7
Black Bullhead	0.2	4.1	3.8	0.3	--	4.3	±2.8
Walleye	1.5	1.8	0.8	1.0	--	3.3	±1.0
White Sucker	--	2.5	0.8	1.0	0.7	2.5	±1.4
Northern Pike	--	0.5	0.2	0.3	--	0.5	±0.3
Common Carp	--	0.5	0.3	--	0.2	0.5	±0.3
Shorthead Redhorse	--	0.3	--	--	0.3	0.3	±0.4
Bluegill	0.2	0.1	--	--	0.1	0.3	±0.3
Black Crappie	--	0.2	0.2	--	--	0.2	±0.2
Flathead Catfish	--	0.2	0.2	--	--	0.2	±0.2

Length categories can be found in Appendix A.

Trap Net Catch

Bluegill (53.4%), black crappie (23.2%) and common carp (5.7%) were the most abundant species caught in the trap nets (Table 3). Twelve additional species were also sampled.

Table 3. Total catch from twelve overnight trap net sets at Lake Mitchell, Davison County, July 6-8, 2010.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Bluegill	290	53.4	24.2	±8.1	25.6	58	20	100
Black Crappie	126	23.2	10.5	±5.3	14.9	75	23	99
Common Carp	31	5.7	2.6	±1.9	3.1	90	35	91
Shorthead Redhorse	29	5.3	2.4	±1.4	7.5	100	100	90
Channel Catfish	22	4.1	1.8	±0.8	6.6	85	10	93
Smallmouth Bass	19	3.5	1.6	±0.6	0.3	--	--	--
White Sucker	11	2.0	0.9	±0.5	0.3	82	82	94
Walleye	3	0.6	0.3	±0.2	0.6	--	--	--
Freshwater Drum	3	0.6	0.3	±0.2	0.6	--	--	--
White Crappie	2	0.4	0.2	±0.2	0.2	--	--	--
Black Bullhead	2	0.4	0.2	±0.1	1.0	--	--	--
Northern Pike	2	0.4	0.2	±0.1	0.3	--	--	--
Bigmouth Buffalo	1	0.2	0.1	±0.1	0.0	--	--	--
Hybrid Sunfish	1	0.2	0.1	±0.1	0.0	--	--	--
Flathead Catfish	1	0.2	0.1	±0.1	0.0	--	--	--

* 10 years (2000-2009)

Table 4. Catch per unit effort by length category for various fish species captured with trap nets in Lake Mitchell July 6-8, 2010.

Species	Substock	Stock	S-Q	Q-P	P+	All sizes	80% C.I.
Bluegill	--	24.2	10.2	9.2	4.8	24.2	±8.1
Black Crappie	0.2	10.4	2.6	5.4	2.4	10.5	±5.3
Common Carp	--	2.6	0.3	1.4	0.9	2.6	±1.9
Shorthead Redhorse	--	2.4	--	--	2.4	2.4	±1.4
Channel Catfish	0.2	1.7	0.2	1.3	1.2	1.8	±0.8
Smallmouth Bass	0.8	0.7	0.3	0.1	0.3	1.6	±0.6
White Sucker	--	0.9	0.2	--	0.7	0.9	±0.5
Walleye	0.2	0.1	--	0.1	--	0.3	±0.2
Freshwater Drum	0.1	0.2	--	0.2	--	0.3	±0.2
White Crappie	--	0.2	0.2	--	--	0.2	±0.2
Black Bullhead	--	0.2	0.2	--	--	0.2	±0.1
Northern Pike	--	0.3	--	0.1	0.2	0.2	±0.1
Bigmouth Buffalo	--	0.1	--	--	0.1	0.1	±0.1
Hybrid Sunfish*	--	--	--	--	--	0.1	±0.1
Flathead Catfish	0.1	--	--	--	--	0.1	±0.1

* No length categories established. Length categories can be found in Appendix A.

Walleye

Management objective: Establish and maintain a walleye population with a gill net CPUE of at least 5 and a growth rate of 35 cm (14 in) in three years.

Lake Mitchell contains a low-density walleye population maintained by consistent, but limited, natural reproduction (Table 6). Stockings in 1993, 1995, 1997 and 1999 failed to increase walleye abundance so it was discontinued. However, another attempt to increase walleye abundance was initiated by stocking fingerlings (1-2 in) in 2006, 2007 and 2009. Stocked fingerlings were OTC-marked in 2009 to evaluate their contribution to the population. A moderate year class was produced that year with stocked fish making a 60% contribution (Table 6). However, CPUE still remains well below the management objective even with these stockings (Table 5).

Table 5. Walleye gill-net CPUE, PSD, RSD-P, and mean Wr for Lake Mitchell, Davison County, 2001-2010.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Mean*
CPUE	1.7	3.0	3.3	1.8	1.1	2.0	1.0	2.7	2.0	3.3	2.1
PSD	--	45	10	45	--	92	--	33	58	55	47
RSD-P	--	18	0	0	--	8	--	0	8	0	6
Mean Wr	--	90	85	85	--	89	--	85	86	83	87

*10 years (2000-2009)

A moderate year class was naturally-produced in 2010. These age-0 walleyes were large and in reasonably good condition (Table 6). Age-1+ walleyes were also abundant, especially given the relatively low number of age-0 walleyes caught in 2009. Growth of age-1+ fish was good and fish are in reasonably good condition.

Table 6. Age-0 and age-1 walleyes sampled during 2 hours of nighttime electrofishing on Lake Mitchell, Davison County, 2000-2010.

Year	Stocking	Age-0 CPH	80% C.I.	% stocked	Mean length (range; mm)	Wr	Age-1 CPH	80% C.I.	Mean length (range; mm)	Wr
2010	none	50	16-84		185 (160-210)	83	18	10-26	283 (260-325)	84
2009	fingerling	37	15-59	59	183 (156-226)	91	1	0-2	250	91
2008	none	8	3-13		180 (156-211)	89	2	1-3	301 (287-305)	88
2001	none	73	33-111		187 (145-218)		2	0-3	267 (255-273)	
2000	none	21	9-33		173 (141-203)		23		230 (207-270)	

Black Crappie

Management objective: Maintain a black crappie fishery with a trap net CPUE of at least 20 and PSD of at least 40.

The black crappie population is very cyclic and the abundance objective of 20 fish/trap net set has only been reached in 5 of the last 15 years. However, crappie CPUE has been slowly increasing since 2008 (Table 7). The size structure of the population and growth is excellent (Tables 7 and 8). Condition (Wr) was reasonably good, but below average from past surveys.

Table 7. Black crappie trap-net CPUE, PSD, and mean Wr for Lake Mitchell, Davison County, 2001-2010.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Mean*
CPUE	32.6	14.5	12.0	5.4	3.8	49.5	9.3	1.6	2.2	10.5	14.9
PSD	74	39	90	95	77	3	50	59	86	75	58
RSD-P	2	3	3	27	60	0	2	3	7	23	11
Mean Wr	118	120	105	102	110	113	109	105	110	99	111

*10 years (2000-2009)

Table 8. Average back-calculated lengths (mm) for each age class of black crappie in Lake Mitchell, Davison County, 2010.

			Back-calculation Age							
Year Class	Age	N	1	2	3	4	5	6	7	8
2009	1	26	96							
2008	2	19	95	182						
2007	3	75	106	189	235					
2006	4	6	98	156	220	254				
2005	5	1	117	181	223	251	273			
All Classes		**127**	**103**	**177**	**226**	**252**	**273**			
Statewide Mean			83	147	195	229	249			
Region III Mean			95	167	219	253	274			
LLI Mean			89	161	210	247	271			

Bluegill

Management objective: Maintain a bluegill fishery with a trap net CPUE of at least 20 and RSD-18 of at least 20.

Bluegill CPUE has also increased since 2009 (Table 9). The bluegill population also exhibits the same cyclic tendencies as the crappie population (Table 9). The fact that the crappie and bluegill cycles are synchronous indicates that environmental factors are most likely affecting recruitment of both species. Most of the bluegills sampled were from the 2007 and 2008 year classes (Table 10 and Figure 2). Growth is better than statewide, regional and small lakes and impoundments averages (Table 10) and fish condition is good.

Table 9. Bluegill trap-net CPUE, PSD, RSD-18, RSD-P, and mean Wr for Lake Mitchell, Davison County, 2001-2010.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Mean*
CPUE	35.2	36.1	31.1	6.4	19.8	53.4	39.2	17.2	4.3	24.2	25.6
PSD	99	93	99	76	52	56	87	86	84	58	82
RSD-18	86	89	67	66	39	9	29	61	71	40	59
RSD-P	23	73	57	63	30	5	3	13	53	20	38
Mean Wr	116	116	112	99	117	107	107	111	106	100	111

*10 years (2000-2009)

Table 10. Average back-calculated lengths (mm) for each age class of bluegill in Lake Mitchell, Davison County, 2010.

			Back-calculation Age							
Year Class	Age	N	1	2	3	4	5	6	7	8
2008	2	114	49	109						
2007	3	113	63	129	177					
2006	4	14	57	118	167	204				
2005	5	13	84	141	182	209	222			
2004	6	2	51	91	157	189	205	215		
2003	7	2	51	90	153	169	189	210	220	
All Classes		**258**	**59**	**113**	**167**	**193**	**205**	**213**	**220**	
Statewide Mean			55	103	141	166	180			
Region III Mean			60	116	157	180	190			
LLI Mean			62	109	149	173	180			

All Fish Species

Smallmouth bass trap-net CPUE and white sucker gill-net CPUE increased in 2010 (Table 11). Flathead catfish CPUE also increased from one to two fish sampled. The CPUE for all other species was within previously observed ranges (Table 14). Lake Mitchell has a diverse fish community with 15 species sampled this year and 21 species sampled in the past ten years (Table 14).

Table 11. Gill-net (GN) or trap-net (TN) CPUE for all fish species sampled in Lake Mitchell, Davison County, 2001-2010.

Species	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
COC (GN)	1.0	1.0	--	0.3	1.9	1.2	1.0	0.5	0.7	0.5
COC (TN)	3.2	1.5	2.1	2.6	4.8	2.4	1.7	2.6	6.3	2.6
RIC (GN)	--	--	--	--	0.1	--	--	--	--	--
RIC (TN)	--	--	--	--	--	--	--	--	--	--
WHS (GN)	0.3	0.2	--	0.8	0.8	1.2	0.3	0.5	0.8	2.5
WHS (TN)	0.1	0.6	0.3	0.1	0.6	0.1	0.3	0.1	0.3	0.9
BIB (GN)	--	0.2	1.0	--	--	--	--	--	0.2	--
BIB (TN)	--	--	--	--	0.1	--	0.2	--	--	0.1
SHR (GN)	9.7	9.5	20.0	9.3	6.0	7.7	0.3	0.2	0.8	0.3
SHR (TN)	12.2	9.5	5.6	6.8	10.2	3.3	2.9	1.7	1.1	2.4
BLB (GN)	2.3	0.3	--	0.3	--	--	0.3	1.5	0.2	4.3
BLB (TN)	1.2	0.4	0.2	--	0.2	0.7	--	--	0.3	0.2
BCF (GN)	--	--	--	--	--	--	--	--	--	--
BCF (TN)	--	--	--	--	--	--	--	--	0.1	--
CCF (GN)	19.0	7.3	15.0	3.3	5.3	4.3	6.0	2.7	4.2	5.7
CCF (TN)	4.9	2.4	16.8	3.9	3.2	1.5	1.2	24.4	6.0	1.8
FCF (GN)	--	--	--	--	--	--	--	--	--	0.2
FCF (TN)	--	--	--	--	--	--	0.1	0.1	0.1	0.1
NOP (GN)	0.2	--	--	0.5	0.6	0.5	0.3	1.2	1.8	0.5
NOP (TN)	0.2	0.5	0.3	0.5	0.2	0.4	0.1	0.2	0.3	0.2
GSF (GN)	--	--	--	--	--	--	--	--	--	--
GSF (TN)	--	--	0.3	--	--	0.1	0.1	0.1	--	--
HYB (GN)	--	--	--	--	--	--	--	--	--	--
HYB (TN)	--	0.2	--	--	--	--	--	0.1	--	0.1
OSF (GN)	--	--	--	--	--	--	--	--	--	--
OSF (TN)	--	--	--	--	0.1	--	--	--	--	--
BLG (GN)	0.7	0.3	0.7	0.8	0.9	0.8	--	--	0.2	0.3
BLG (TN)	35.2	36.1	31.1	6.4	19.8	53.4	39.2	17.2	4.3	24.2
SMB (GN)	--	--	0.3	--	--	--	--	--	--	--
SMB (TN)	0.3	0.4	0.6	0.1	0.3	0.3	--	0.5	0.4	1.6
LMB (GN)	--	--	--	--	--	--	--	--	--	--
LMB (TN)	--	0.5	0.3	0.1	0.2	1.6	--	--	--	--
WHC(GN)	0.2	0.2	0.3	0.2	--	--	--	--	--	--
WHC (TN)	0.4	0.5	--	0.1	--	0.2	0.3	--	--	0.2
BLC (GN)	6.7	0.5	2.7	0.3	0.5	5.2	0.4	0.3	0.5	0.2
BLC (TN)	32.6	14.5	12.0	5.4	3.8	49.5	9.3	1.6	2.3	10.5
SAR (GN)	--	--	--	--	--	--	0.1	--	--	--
SAR (TN)	--	--	--	--	--	--	--	--	--	--
WAE (GN)	1.7	3.0	3.3	1.8	1.1	2.0	1.0	2.7	2.0	3.3
WAE (TN)	0.7	0.9	--	0.4	0.4	--	0.4	0.6	0.3	0.3
FRD (GN)	7.7	17.8	6.3	6.7	10.0	7.0	9.9	3.5	2.2	5.2
FRD (TN)	0.7	1.0	0.3	1.2	0.2	0.5	0.5	0.7	0.1	0.3

COC (Common Carp), RIC (River Carpsucker), WHS (White Sucker), BIB (Bigmouth Buffalo), SHR (Shorthead Redhorse), BLB (Black Bullhead), BCF (Blue Catfish), CCF (Channel Catfish), FCF (Flathead Catfish), NOP (Northern Pike), GSF (Green Sunfish), HYB (Hybrid Sunfish), OSF (Orange-spotted Sunfish), BLG (Bluegill), SMB (Smallmouth Bass), LMB (Largemouth Bass), WHC (White Crappie), BLC (Black Crappie), SAR (Sauger), WAE (Walleye), FRD (Freshwater Drum),

MANAGEMENT RECOMMENDATIONS

1. Monitor the Lake Mitchell fishery with annual netting surveys to sample the general fish population and biennial electrofishing surveys to sample the bass population.

2. Work with the city of Mitchell and local sportsmen to preserve and enhance water quality and aquatic habitat.

3. Stock OTC-marked walleye fingerlings every other year in an attempt to accomplish the management objective. Conduct fall electrofishing surveys annually to evaluate contributions of stocked and naturally-produced fish to the fishery.

Table 12. Stocking record for Lake Mitchell, Davison County, 1991-2010.

Year	Number	Species	Size
1991	67,000	Saugeye	Fingerling
1992	35,000	Largemouth Bass	Fingerling
	67,000	Saugeye	Fingerling
	35,000	Smallmouth Bass	Fingerling
1993	82,900	White Crappie	Fingerling
	70,000	Walleye	Fingerling
	67,200	Smallmouth Bass	Fingerling
1994	13,125	Channel Catfish	Fingerling
1995	12,438	Black Crappie	Adult
	67,000	Walleye	Fingerling
1996	22,746	Black Crappie	Fingerling
	3,198	Black Crappie	Adult
	42,500	Smallmouth Bass	Fingerling
1997	254,205	Walleye	Fingerling
1999	73,700	Walleye	Fingerling
	13,850	Walleye	Large Fingerling
2003	20,640	Black Crappie	Fingerling
2006	67,760	Walleye	Fingerling
2007	5,192	Walleye	Large Fingerling
2009	67,500	Walleye	Fingerling

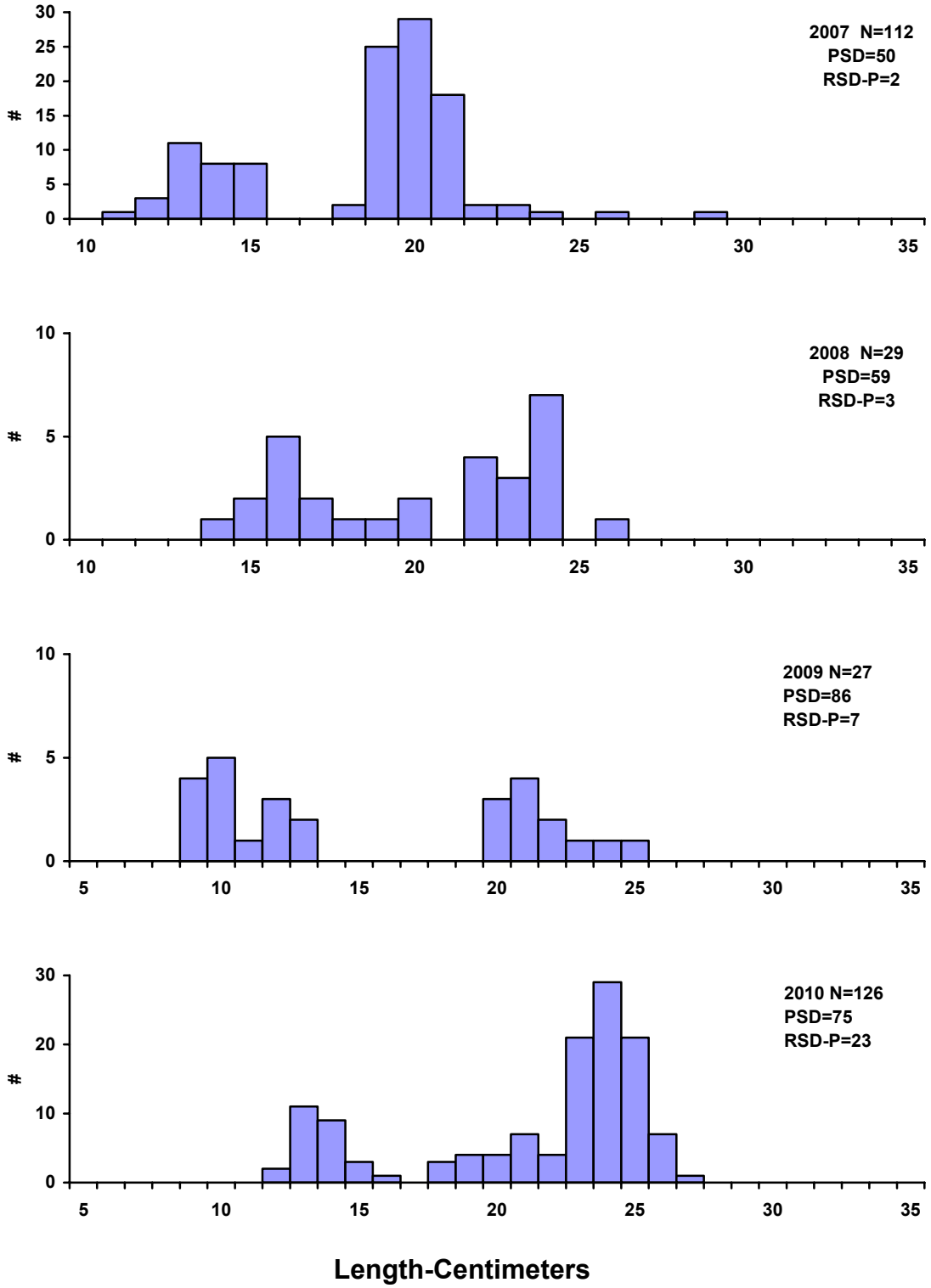


Figure 1. Length frequency histograms for black crappies sampled with trap nets in Lake Mitchell, Davison County, 2007-2010.

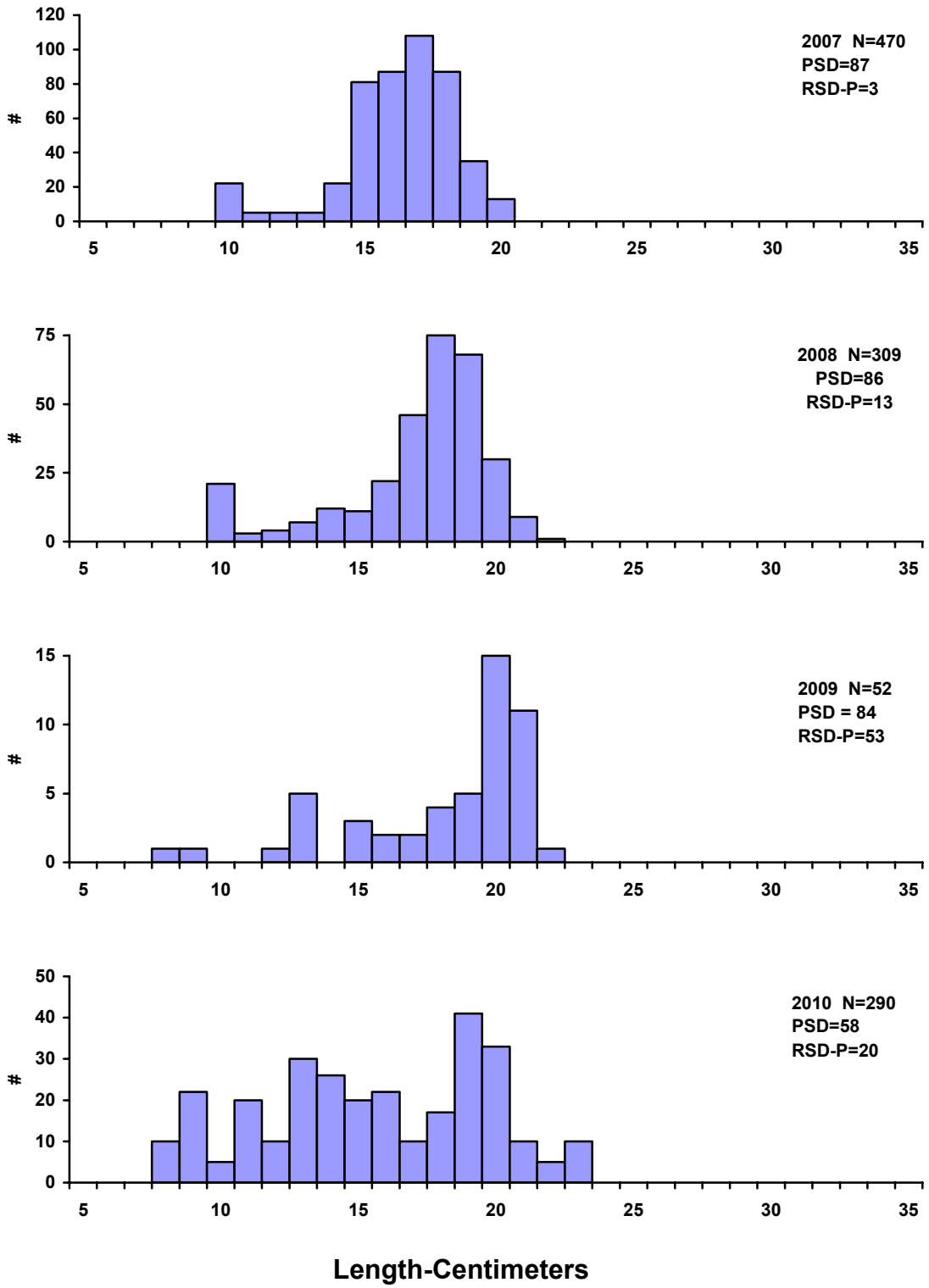
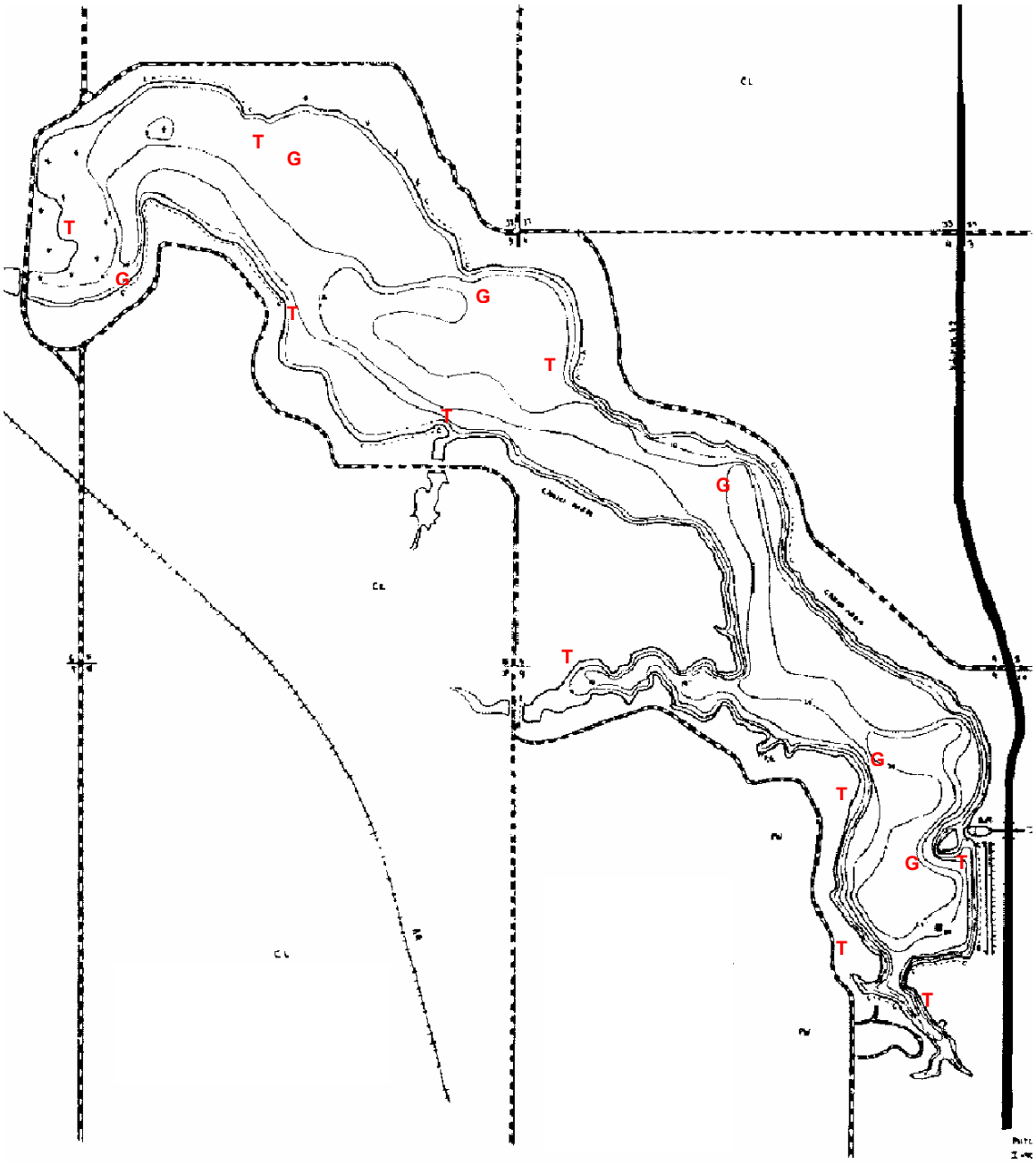


Figure 2. Length frequency histograms for bluegill sampled with trap nets in Lake Mitchell, Davison County, 2007-2010.



Legend
Gill Nets: G
Trap Nets: T

Figure 3. Sampling locations on Lake Mitchell, Davison County, 2010.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$PSD = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$RSD\text{-}P = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters (inches in parenthesis).

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25 (10)	38 (15)	51 (20)	63 (25)	76 (30)
Yellow perch	13 (5)	20 (8)	25 (10)	30 (12)	38 (15)
Black crappie	13 (5)	20 (8)	25(10)	30 (12)	38 (15)
White crappie	13 (5)	20 (8)	25(10)	30 (12)	38 (15)
Bluegill	8 (3)	15 (6)	20 (8)	25 (10)	30 (12)
Largemouth bass	20 (8)	30 (12)	38 (15)	51 (20)	63 (25)
Smallmouth bass	18 (7)	28 (11)	35(14)	43 (17)	51 (20)
Northern pike	35 (14)	53 (21)	71 (28)	86 (34)	112 (44)
Channel catfish	28 (11)	41 (16)	61 (24)	71 (28)	91 (36)
Black bullhead	15 (6)	23 (9)	30 (12)	38 (15)	46 (18)
Common carp	28 (11)	41 (16)	53 (21)	66 (26)	84 (33)
Bigmouth buffalo	28 (11)	41 (16)	53 (21)	66 (26)	84 (33)

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.